1. BACKGROUND

1.1. Public transport between Heathrow Airport and Central London is now mainly by coach services from the airlines' London terminals. Road congestion and the growth of air travel are making this increasingly unsatisfactory. A study by the Transport Co-ordinating Council for London (TCCL) in 1967 showed that, largely because both British Rail and London Transport could use existing track for most of the way, the best way to improve the situation was likely to be by a conventional rail link.

1.2. The majority recommendation of the 1967 TCCL report favoured a British Rail link with Victoria to replace the coach services. But there proved to be very great practical difficulties in attempting to put this into effect. So, in September 1969, the President of the Board of Trade and the Minister of Transport asked the interested bodies to re-examine the problem. The Heathrow Link Steering Group was set up to do this under chairmanship from the Ministry of Transport. The Group comprised representatives of:—

Board of Trade	British Airports Authority
Ministry of Transport	British European Airways
Greater London Council	British Overseas Airways
Westminster City Council	British Rail
	London Transport

This report summarises the study and sets out our conclusions.

2. OUTLINE OF THE STUDY

2.1. We saw no reason to doubt the conclusion of the TCCL study that a conventional rail link would provide the best answer, and did not consider less conventional links such as monorails. The two rail links the Group considered were:—

a. by British Rail from Victoria

b. by an extension of London Transport's Piccadilly Line to the Airport.

British Rail could provide an exclusive service from Victoria and check-in facilities there which might allow the present coach service to be withdrawn. Because we did not consider it acceptable to do away entirely with check-in at a London centre, we decided the Piccadilly Line service would not be satisfactory as the sole public transport link with the Airport. So we examined the four possibilities set out in Table 1. Capital costs are for the rail link and associated terminal facilities. They do not include the capital costs of continued coach operation in schemes BR 2, BR 3 and LT. Capitalised interest at 10% during construction is included.

TABLE 1

The Schemes Considered

Scheme	Service	Capital Cost	Approximate Construction Time
		£m	Years
BR 1	An exclusive British Rail link between Victoria and Heathrow, with check-in at Victoria and with coach services withdrawn	38	5
BR 2	A similar link to BR 1 but with coach services continuing	35	5
BR 3	A similar link to BR 1 but without check-in at Victoria and with coach services continuing	26	5
LT	Extension of the Piccadilly Line to Heathrow, with coach services continuing	19	4

2.2. The British Rail link would involve building a spur into the Airport from the existing track near Feltham. There would be a non-stop service by electric trains, every 10 minutes during the day and every 15 minutes at night, taking 23 minutes for the trip. New rolling stock would be provided. In schemes BR 1 and BR 2, passengers would be able to check-in for their flights and hand in their baggage at Victoria. Baggage would be sorted by flights into containers which would be carried on the trains to the Airport where the containers would go to the appropriate terminal. Passengers would not need to handle their baggage between Victoria and their flight destination. Although no satisfactory baggage system has yet been developed, the group which studied the problem (comprising representatives from BAA, BEA, BOAC and BR) concluded that, given enough time and money, this could be done. In the BR 3 scheme passengers would look after their own baggage in the ordinary way, with porters available at Victoria for those who wanted them. British Rail have suggested single fares (at current prices) of 10*s* for BR 1 and BR 2, and 8*s* for BR 3.

2.3. The London Transport link would be an extension of the Piccadilly Line from Hounslow West, with an intermediate station in the Airport maintenance area. Trains would run at 4 minute intervals in the peak and up to 7½ minutes outside it. They would not run at all in the small hours leaving the coaches as the only public transport link for the 2% or so of passengers travelling at those times. Two additional trains would be needed, but for the most part the present Piccadilly Line rolling stock would continue to be used. Four seats in each coach, by the double doors, would be removed to make way for luggage racks. The journey would take longer but would be cheaper than by British Rail—for example, Hyde Park Corner to the Airport would take about 35 minutes for which the single fare would be 5*s*. The service would have the added advantage of multiple access and dispersal points as it would serve all the stations on the Piccadilly Line.

2.4. To provide a basis for comparing the rail link options, we evaluated the effects of continuing the present coach service as the main public transport link; this might be ragarded as effectively a "do nothing" situation. For example, by 1981 average coach journey times from the West London terminal to Heathrow are expected to increase from the present 35 minutes to 45 minutes, and eastbound trips would take longer. Reliability will deteriorate because traffic congestion, not just in the peaks but throughout the day, will cause some coaches to be delayed much more than the average.

2.5. We calculated the future costs of continued coach services not only to the operator and to the user but also to the community (mainly in road congestion). These costs were then compared with the costs and benefits of the four rail links. Factors likely to affect the ranking of the schemes, but which we could not measure in money terms, have also been identified and discussed. The detail of these calculations and comparisons and the evidence on which they are based are contained in Part II of our report.

2.6. For the purposes of this study benefits are defined as the total of savings in operating costs, time savings by users and reduced road congestion costs. The costs of each proposal have been taken as those additional to the cost of maintaining a coach link capable of dealing with the expected growth in air travel. The values of both costs and benefits arising over a 25 year period have been discounted to 1970 at 10%.

3. THE FINDINGS

3.1. *Traffic forecasts*

3.1.1. The benefits and some of the costs of all the schemes depend on forecasts of the growth in air travel, and on the proportion of airport passengers expected to use public transport between Heathrow and Central London. We have estimated that the number of air passengers using Heathrow will grow to between 31·5 million and 42·2 million a year by 1981. Because of the uncertainty attached to forecasting beyond then and the likely constraints on capacity at Heathrow we have assumed that traffic will cease to grow after 1981, while recognising that this could be a conservative assumption. There is no evidence that the means available for travel to the airport would affect the level of demand for air travel.

3.1.2. The number of passengers assumed to use public transport under each of the four schemes is shown in Table 2. These predictions were calculated from the actual behaviour of Heathrow passengers in choosing between private and public transport, as observed during the studies which consultants carried out for TCCL in 1966.

TABLE 2

Total airport passengers by public transport in 1981 (thousands)

Scheme	BR 1				BR 2				BR 3				LT			
Type	Air passen-gers	Air-port workers	Others	Total	Air passen-gers	Air-port workers	Others	Total	Air passen-gers	Air-port workers	Others	Total	Air passen-gers	Air-port workers	Others	Total
Coach	0	0	0	0	6500	65	408	6973	6440	65	408	6913	6440	0	320	6760
Rail	13200	200	800	14200	6700	135	408	7243	8050	135	408	8593	10400	5620	864	16884
Total	13200	200	800	14200	13200	200	816	14216	14490	200	816	15506	16840	5620	1184	23644

3.2. *The costs and benefits calculated*

3.2.1. There are two common decision rules that can be used for ranking schemes such as these. They are:—

a. the difference between discounted benefits and costs

b. the ratio of the sum of future net benefits to capital costs (both discounted to a common year)

As Table 3 shows, the ranking of the four schemes is the same on either basis.

TABLE 3

Quantifiable Social Costs and Benefits compared with "Coaches only" situation

Costs and Benefits	BR 1	BR 2	BR 3	LT
Direct "money" costs	£m +17·6	£m +25·9	£m +12·2	£m + 5·3
User costs—largely time savings	—19·4	—19·4	—35·4	—35·2
Indirect social costs, mainly in road congestion	— 0·9	— 0·5	— 0·9	— 1·6
a. Total cost change	— 2·7	+ 6·0	—24·1	—31·5
b. Ratio of net benefits to capital cost	1·1	0·7	2·5	3·6

+ represents an increase in costs.

— represents a reduction in costs.

Direct costs of schemes BR 2, BR 3 and LT include not only expenditure on building and operating the rail link but also on the cost of continued coach services.

3.2.2. In arriving at these results we had to make various assumptions, some or all of which might affect the comparison. We therefore tested our results by re-working the figures on the basis of the most extreme assumptions that seem to us to be within the bounds of possibility. Changes in general assumptions, such as forecasts of future air traffic, affect all the schemes in the same way, so that it would not be right to compare the figures for one scheme at, for example, high air traffic assumptions with another at low ones. Other assumptions, such as estimates of costs of construction, can affect individual schemes differently. We attempted to assess the best and worst credible combinations of all the assumptions. The results are summarised in Tables 4 and 5.

TABLE 4

Ratio of benefits to costs under the various combinations of general and specific assumptions for Schemes BR 1, BR 2 and LT

Combination of general assumptions for all three schemes	Specific assumptions for each scheme	BR 1	BR 2	LT
Best	Best	1·8	1·4	3·8
Best	Worst	1·1	0·7	2·7
Worst	Best	0·6	0·3	1·8
Worst	Worst	0·3	0·1	1·1

3.2.3. Table 4 shows the comparison between the LT scheme which does not offer a London check-in facility to rail passengers and schemes BR 1 and BR 2 which do provide this facility. We have assumed for the purposes of this sensitivity test that *all* travellers would value the greater comfort and convenience of being able to check-in in Central London at 2*s* per trip. The effects of this penalty on the numbers of people who would choose to use private cars or coaches rather than the Underground link were considered as well as the reduced benefits to those who would still use the system. We also assessed the effects of a possibly less comfortable journey on the Piccadilly Line, because of baggage handling or crowding, by imposing a penalty of 1*s* per trip. In fact many people would not value the option of in-town check-in at all and the majority of LT travellers would have a perfectly comfortable journey without baggage handling difficulties. So the penalties we tested are almost certainly the most that could reasonably be applied, given that they are applied to *all* trips.

3.2.4. Under both the most optimistic and the most pessimistic general assumptions for the rail link the specific assumptions least favourable to the LT scheme produce a higher proportion of benefits to costs than the most favourable specific assumptions about either BR alternative. In other words the London Transport solution shows up best even when the specific assumptions are weighted against it.

TABLE 5

Ratio of benefits to costs under the various combinations of general and specific assumptions for Schemes BR 3 and LT

Combination of general assumptions for both schemes	Specific assumptions for each scheme	BR 3	LT
Best	Best	2·6	3·8
Best	Worst	2·2	3·1
Worst	Best	0·8	1·4
Worst	Worst	0·7	1·1

3.2.5. Table 5 shows similar comparisons for the BR 3 and LT schemes, neither of which provides check-in facilities in Central London for rail passengers. Again the LT scheme has the highest ratio of benefits to costs even in the circumstances which favour it least.

3.2.6. It is significant that on any reasonable combination of the most pessimistic general and specific assumptions the benefits of the LT link are greater than its costs.

3.3. *The factors which have not been included in the calculations.*

3.3.1. The effects of the following significant factors which cannot be costed in money terms must also be taken into account:—

a. the advantages of choice in the schemes which offer both rail and coach travel
b. the choice of being able to check-in in Central London or of saving time by checking-in at the airport
c. comfort
d. baggage handling facilities
e. reliability
f. town planning considerations

Our assessment of these factors is summarised in Table 6.

TABLE 6

Factors affecting choice of link which have not been included in the cost-benefit calculations

Factor	BR 1	BR 2	BR 3	LT
Choice of 2 public modes	No	Yes	Yes	Yes
Option of check-in in central London for rail-link passengers	Yes	Yes	No	No
Comfort	Good	Good	Good	Fair/Good
Baggage handling	Very Good*	Very Good*	Fair/Good	Fair
Reliability	Good	Good	Good	Very Good
Town Planning	Acceptable	Acceptable	Acceptable	Acceptable

*Assuming a reliable system can be developed

3.3.2. In our view, the most important single unquantifiable factor is the advantage of being able to choose between coach and rail travel. For a traveller can then go by coach if he puts a high value on comfort and would therefore suffer disproportionately from having to carry his own luggage, or risking standing for a while on the Underground. Alternatively there is the rail link, if reliability is the over-riding need and the possibility of delays on the road rule out going by coach.

3.3.3. The BR 1 and BR 2 schemes offer the convenience of checking-in at Victoria. There is also the option of saving time by going direct to the airport and checking-in there, as in schemes BR 3 and LT. The choice would not be advertised because the airlines consider that to do this would cause confusion. So not everyone would realise that it was available. But some travellers would find out from their air tickets, or by experience, that they had this choice.

3.3.4. All three BR schemes have some advantage over the LT one on the grounds of comfort and baggage handling. There are clearly advantages of convenience for some people in handing over their baggage in London. Without this facility the advantages of travel by British Rail are less significant. But BR 3 still offers overhead luggage racks so that baggage can be kept close to hand, as opposed to the LT baggage racks by the main doors of their trains. And there would be porters available at Victoria. The BR schemes could also offer every passenger a seat at all times. Peak period overcrowding on the Piccadilly Line (which would affect all travellers, not just airport passengers) is of short duration but, while far from intolerable, it would make this link less comfortable than the BR link at these times. On the other hand, under the LT scheme, airport passengers who put a high value on a guaranteed seat in the peak periods (there is ample seating capacity outside them) can, with some loss of time and reliability, go by coach. The sensitivity tests described in para 3.2.3. above are a guide to the importance of these factors.

3.3.5. More generally, the LT scheme gains a slight advantage in reliability, since the service is less likely to be affected by extreme weather conditions or by inter-action with other services. The LT link alone offers a comprehensive service to airport workers. Because it has two stations within the airport it could also be useful for internal journeys there.

3.3.6. So far as we could discover none of the schemes would be likely to raise major objections from the local planning authorities concerned. Both links offer some potential for associated development subject, of course, to planning permission. Because of the number of stations served by the Piccadilly Line, the London Transport link may offer greater though more dispersed scope in this respect. But it does not seem that any difference will be significant enough to influence choice between a British Rail or a London Transport link.

3.4. *Financial assessment*

3.4.1. We assessed the financial results for each scheme using the same traffic and cost estimates as in the cost-benefit analysis. The results are shown in Tables 7 and 8. They are based on our high air traffic estimates (which compare closely with those derived independently for the Third London Airport Inquiry). The LT scheme comes first in this ranking too. But the BR 1 scheme comes second and the BR 3 scheme third, in reverse order to the results of the cost-benefit analysis. The BR 2 scheme remains the lowest ranking scheme. Like the cost-benefit analysis the financial assessments are affected by changes in the assumptions on which they are based, but the changes we assessed had no effect on the ranking order.

SUMMARY OF FINANCIAL ASSESSMENT

TABLE 7

Revenue Results in two Sample Years

	Schemes							
	BR 1		BR 2		BR 3		LT	
Capital Cost (£m)	38·3		35·0		26·2		19·0	
	1975	*1985*	*1975*	*1985*	*1975*	*1985*	*1975*	*1985*
Gross Annual Revenue (£m)	5·3	7·5	2·9	4·0	2·4	3·5	2·4	3·4
Operating Costs (£m)	2·0	2·4	1·7	2·0	0·9	1·0	0·5	0·5
Single Year Rate of Return	8·6%	13·3%	3·4%	5·7%	5·8%	9·6%	10%	15·3%

3.4.2. Table 8 shows the corresponding internal rates of return.

TABLES

Internal rate of return to 1970 over 25 years

BR 1	9.9%
BR 2	2.0%
BR 3	6.5%
LT	11.5%

4. THE SCHEMES COMPARED

4.1. The Group concludes that scheme BR 1 should be excluded from further consideration. It is most unlikely that the airlines would be prepared to withdraw their coaches; the cost-benefit ratio of the scheme would be poor; and its financial viability, even on the highest traffic estimates, is doubtful. Its specific unquantified advantage relies heavily on the development of a sophisticated baggage handling system. This advantage must be set against the restriction of choice through the withdrawal of the coaches.

4.2. The BR 2 scheme offers very good standards of comfort and convenience but ranks lowest of all on both cost-benefit and financial grounds. In cost-benefit terms, the advantages of being able to check-in at Victoria, assuming a reliable baggage handling system can be developed, would have to be valued at some £30m to £38m (depending on the decision rule used) to bring it to parity with the BR 3 proposal (in revenue terms the gap is about £10m). We do not believe that the benefits of check-in and baggage handling at Victoria could reasonably be valued so highly.

4.3. We therefore see the real choice to be between the BR 3 and LT schemes. The BR scheme offers its passengers a shorter journey time in transit, a guaranteed seat and rather better baggage facilities. It provides a direct link between the airport and a single point in Central London. Those factors have to be set against London Transport's cheaper fare, slight advantage in reliability and its much better showing both in the cost-benefit analysis and in the financial assessment. It provides, as distinct from British Rail, dispersed access over Central London, and an added facility for workers within the airport complex.

5. CONCLUSIONS

5.1. We have tried to quantify costs and benefits wherever it could sensibly be done. On that basis the best rail link is clearly the Piccadilly Line extension. We have tested the importance of factors we could not quantify, like comfort, baggage handling and reliability, by putting large monetary values on them and testing the effects of this on our assessment of each scheme. We have also tested the effects of adopting different assumptions, forecasts and values for the many variables in the calculations. Having made these tests we do not believe that there is a credible set of assumptions which would make any of the other schemes preferable to the Piccadilly Line extension within the framework of our cost-benefit analysis and financial assessment.

5.2. We conclude that there are considerable benefits to be gained by supplementing the present coach services between Central London and Heathrow by a rail link. If a rail link is built then it should be an extension of London Transport's Piccadilly Line from Hounslow West to Heathrow. There are always competing claims on resources and we could not attempt to compare a Heathrow Link with them. But, in the light of all the factors we could take into account, we believe that the Piccadilly Line extension would be a worthwhile investment.

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MINISTRY OF TRANSPORT

Report of a study of

Rail Links with Heathrow Airport

Part I

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This assessment of possible rail links between Heathrow and Central London was commissioned jointly by the President of the Board of Trade and myself. It examines three British Rail proposals and one from London Transport, and concludes that the best solution would be an extension of the London Transport Piccadilly Line.

There are many interests involved. I am therefore publishing this report to give all concerned an opportunity to comment on it, so that their views can be taken into account when these findings are being considered.

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REPORT OF THE HEATHROW LINK STEERING GROUP

PART I SUMMARY AND CONCLUSIONS